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ABSTRACT

Presented is a letter regarding the final report of a project involving the followup of 151 children (under 6 years old at the time of the initial assessment) to establish the accuracy of the Denver Developmental Screening Test in predicting school achievement problems. Reviewed are the procedures used in selecting the study population, and explained are changes made in the proposal regarding the followup assessments. (SB)

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July 2, 1976

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90-C-257

RE: Final Report - Terminated OCD Grant No: ~~OCD-CB-283~~
Implications of Early Screening for Later Development
Project Period: July 1, 1974 - February 28, 1976

Dear Doctor Grotberg and Miss Stewart:

The objective of this project was to establish the predictive accuracy of the Denver Developmental Screening Test (DDST). Outcome measures included school status, achievement test scores, intelligence test scores, and behavior ratings by teachers. Prediction measures were DDST classifications of Abnormal, Questionable and Normal. The span of prediction from DDST to follow-up varied around five years. Neurological examination and parent interviews at follow-up were designed to assess influences of each on the child's development since that might help explain errors in prediction from the DDST.

Study Population: In a previous project, paraprofessional screening aides were trained to administer a variety of screening tests, including the DDST. The purpose of that project was to demonstrate the concurrent validity of the screening tests and the acceptance of screening test results by professional staff of pediatric clinics.

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During the period 9/1/69 to 10/31/70, some 3,000 children were screened in the Denver Neighborhood Health Center pediatric clinics. All parents who were visiting the clinics for well-child checks were asked to participate in the original project. If the child was below age six, and the parent consented, the screening tests were done.

All children with non-normal DDST results were referred for follow-up developmental evaluations. A random sample of Normals was also evaluated. A total of 483 children (52 Abnormals, 107 Questionables, and 324 Normals) had completed Stanford-Binets or Bayley Scales of Infant Development within a few weeks of DDST screening. The results of this concurrent validation and cross-validation study were reported in Frankenburg, et al. (1971).

In the Spring of 1973, 65 of the oldest 483 children who had either validation (n = 237) or cross-validation (n = 246) measures were followed-up. This three- to four-year prediction span was from four- to six-year screening results to end-of-third grade school status. The results of this prediction study were reported in Camp, et al. (1974).

At the beginning of this project period (July 1974) a total of 2,715 complete DDST records were available from the original project. Included in these were the 246 children who were selected for cross-validation in 1969-70. Excluded from the 2,715 were the 237 validation children, because the attempt to follow-up these was already made in the previous prediction study by Camp, et al. (1974).

Among the 2,715, 2.7 percent had Abnormal scores, 5.9 percent had Questionable scores, and 91.4 percent had Normal scores. The proposal (Procedures, p. 8, section a.) called for the location of 297 children for follow-up. The follow-up total was to be equally distributed among three DDST classifications and three age-groups at time of screening.

In order to meet the resulting 33 children per cell, we first drew a random sample of 40 DDST records from each of the nine ages by classification cells. For three cells, less than 40 records were available from the 2,715 complete records. The total available Abnormals were limited to 29 and 31 at 0-24 and 24-48 months, respectively. The total available Questionables was limited to 36 at age group 24-48 months.

A total of 336 records were thereby selected. Among these, we were able to obtain complete follow-up information on 149 (47 percent). Unexpected difficulties in locating families were detailed in the 8/31/75 progress report. In that report, we noted that we were delayed by several months in the location of families through the Denver Public Schools (DPS). DPS was busy shuffling students and records during the Summer and Fall of 1974 due to the Denver integration court order issued in the Spring of 1974. About the time

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that records were "settling," the President signed into law the so-called "Buckley Amendment" to the Title programs giving Federal monies to schools. This amendment required schools to have written permission from parents to release any information (including the child's presence in the school). DPS attorneys interpreted the law strictly, and we were obliged to seek out Denver Department of Health and Hospital records to locate families.

The Buckley Amendment interpretation by DPS was relaxed in the Fall of 1975, and an extension on our project period from 9/1/75 to 2/28/76 allowed us to locate additional numbers of the families chosen for follow-up. In this way, the completed follow-up sample rose from 112 on 8/31/75 to 151 at the time of this report.

Among those not followed-up, 91 could not be located. Fifteen were known to have moved beyond metropolitan Denver. Twenty records proved to be siblings of follow-up children or different records for the same child. Four children had died. Twenty-two families refused to participate in follow-up. Thirty-five gave only partial follow-up cooperation, leaving their data incomplete. See Table 1.

Table 1

Location Status of 336 Randomly Selected DDST Records

	N	Percent of 316
Complete follow-up data	149	47
Unable to locate	91	29
Moved from Denver area	15	5
Child died	4	1
Family refused	22	7
Partial follow-up data	35	11
Total follow-up children	316	100
Sibling or duplicated record	20	
Total selected records	336	

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The cause of death of the four known deceased children was obtained from death certificates. Three of the four had Abnormal DDST scores. Only one death was accidental. See Table 2.

Only two children from the original cross-validation study were followed-up both in the Camp, et al. (1974) study and the present study. The twice followed children had DDST Normal scores given in the 48-72 month age period. Otherwise the two prediction studies were non-overlapping samples of the 3,000 originally screened.

Among the 184 children with complete and partial follow-up data, the ages at original DDST screening varied from two months to 72 months (mean = 38 months, median = 40.5 months). Among the 156 children who had office evaluations at follow-up, the ages varied from 62 months to 146 months (mean = 102 months and median = 106.5 months). Grade placement at follow-up varied from beginning kindergarten to end of fifth grade for the 170 children having school data. Forty-two were in kindergarten, 38 in first, 24 in second, 22 in third, 36 in fourth and 8 in fifth grade. No grade placement was recorded for the seven children with no school information and the seven institutionalized retardates.

The time between screening and follow-up varied from 55 months to 82 months (mean and median = 64 months). Thus, most children were followed-up right at five years since original DDST screening.

Follow-up assessments: The proposal (Procedures, p. 9, section c.) called for a DDST on follow-up children below age six, a Stanford-Binet, school administered standardized achievement test, grade placement or special education status, neurological examination and a parent interview with Wittenborn scales designed to tap family attitudes toward education and harmony of family relations. The evaluations were to be done by a staff member who had no knowledge of the child's DDST classification or the results of other follow-up procedures.

Further consideration of the follow-up protocol resulted in the following changes:

1. The DDST was dropped as a follow-up assessment of children younger than age six years. As a follow-up measure, it was of lower priority than the other measures, and time pressures during evaluations mitigated against using the DDST.

2. The Stanford-Binet was used but in short form, to save evaluation time. A full basal and subsequent starred items were given, according to the manual. The test was discontinued for a given child when sufficient mental age was earned to correspond to an IQ score of 91 or more (1972

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Norms). For children not earning sufficient mental age to correspond to IQ 91+, the usual full ceiling was obtained plus administration of non-starred items between basal and ceiling. The effect of this modification of Binet administration was to establish a minimum "normal" IQ in the average or better children and to make the usual full measurement on children with IQs less than 91.

3. School information was collected from the child's cumulative records and from the teacher's completion of the School Behavior Check List (SBCL) by Miller (1972), as stated in the proposal. The summary measures on the achievement tests were changed from grade-equivalent scores to percentiles, because of greater ease of achievement classifications across the wide range of grade placements (K through 6). The grade-equivalent discrepancies used in the proposal corresponded to the 10th percentile on most test norms. The new cut-off score, was the 10th percentile. A child was classified as a school problem when his percentile average over reading and math portions of the test was 10th percentile or less.

4. The neurological exam was given according to a version developed by Walter D. Campbell, M.D., and standardized on a large number of Denver children. The version according to Touwen and Prechtl (1971) was dropped because its standardization was less relevant to Denver children.

5. The parent interviews of Wittenborn (1956) and Bear, Hess and Shipman (1966) were replaced by a portion of the Davé interview regarding the Academic Press of the child's family (Davé, 1963, pp. 154-160). This variable correlated highly with the other Environmental Process variables, and the total "Index of Educational Environment" correlated .80 with total fourth grade school achievement scores and .67 with total fifth grade achievement scores (Davé, 1963, p. 100). Thus, the Academic Press variable accounted for most of the variance among all environmental and achievement variables. Its importance, in terms of accountable variance, and its brevity argued for its use over other Davé interview scales and the Bear, et al. (1966) scale.

6. In terms of family harmony, we felt that the Wittenborn (1956) scales would be too direct and possibly offensive and/or subject to social desirability. Therefore, we elected to use an indirect method of determining the parents' influence on the child's behavioral and emotional adjustment. Schaefer (personal communication) had reported a high degree of reciprocity in the perceptions of parents by children and children by parents. Thus, the parents of our follow-up children were asked to complete the "Child Behavior Toward Parent Inventory" (Schaefer and Finkelstein, 1974). Schaefer's work justified the assumption that parent behavior toward the child could be inferred from the parent's perception

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of the child's behavior toward the parent. The advantage of this indirect method was that parents would, perhaps, feel less judged and their ratings would be more candid.

In summary, minor modifications in methodology were made to better accomplish the objectives spelled out on page 8, section 3 of the proposal. Data was collected in "double-blind" fashion, so that separate staff members administered the Stanford-Binet, neurological, Davé interview, and collected school data. The statistician, who did not administer any of the above, was the only one with knowledge of DDST findings and "Child Behavior toward Parent" ratings.

For the most part, the procedures in the proposal have been closely followed. Evaluation of all but Objective (a) on page 8 of the proposal is possible with available data. A report of some of the data has already been made at the Plenary Session of the Society for Pediatric Research meeting in St. Louis, April 28, 1976. See enclosed paper. Additional publications, focusing on different aspects of the data, are in preparation for submission to pediatric, psychology and special education journals. When these manuscripts are completed, they will be submitted to OCD.

Sincerely yours,

William K Frankenburg

William K. Frankenburg, M.D.
Associate Professor of Pediatrics

WKF:WJVD/jme
Enclosure

RECEIVED
26 JUL 1976